

CLAIMS

1. A process for a feed gas mixture passing through a heat exchanger and a reactor containing both an electrically heated catalyst and the novel metal washcoated metal monolith catalyst to be converted to the mixture of hydrogen and carbon monoxide by the catalytic partial oxidation reaction comprising:
 - a) providing a feed gas mixture comprising oxygen containing gas and a hydrocarbon feedstock comprising methane, natural gas, LPG, naphtha, gasoline and diesel oil, said mixture being characterized by an atomic carbon to atomic oxygen ratio of between 0.7 to 1.0;
 - b) passing said feed gas mixture at the room temperature through a heat exchanger to be preheated by the hot product gas stream before being introduced to the reactor;
 - c) providing a reactor containing a catalyst structure comprising a supported noble metal catalyst washcoated on a metal monolith;
 - d) providing an electrically heated catalyst installed in front of said catalyst structure comprising a supported noble metal catalyst washcoated on a metal monolith within said reactor for igniting the partial oxidation reaction;
 - e) passing said ignited feed gas mixture through said metal monolith catalyst to be converted to hydrogen and carbon monoxide and to be heated by the heat of the partial oxidation reaction;
 - f) passing said heated product gas stream through said heat exchanger to provide heat to said feed gas mixture at the room temperature.

2. The process of claim 1, wherein said oxygen containing gas comprises air.

3. The process of claim 1, wherein said oxygen containing gas comprises air with enriched oxygen content.

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4. The process of claim 1, wherein said supported noble metal catalyst comprises one or combination of Pd, Pt and Ru supported on high surface area aluminum oxide promoted by cerium oxide and other alkali compounds.

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5. The process of claim 4, wherein said alkali compounds comprise barium and strontium, said noble metal being present between 1 to 20 wt% of washcoat.

6. The process of claim 4, wherein said noble metal being present between 1 to 20 wt. % of washcoat.

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7. The process of claim 4, wherein said supported noble metal catalyst washcoat is being present on a metal monolith between 0.01 to 0.4 g/cc of monolith.

8. The process of claim 1, wherein said metal monolith is made by high temperature alloy plate.

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9. The process of claim 8, wherein said high temperature alloy plate comprises iron-chrome-aluminum alloy plate, nickel-chrome-aluminum alloy plate or nickel-chrome alloy plate.

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10. The process of claim 1, wherein said metal monolith has open-channel structure, said open-channel structure has the cell density between 50 to 1000 cells per square inch.

11. The process of claim 1, wherein the space velocity is within the range of 10,000
5 hr-1 to 500,000 hr-1.

12. The process of claim 1, wherein said electrically heated catalyst comprises said metal monolith with both end welded by electric wires, said metal monolith is noble metal washcoated.

10 13. The process of claim 1, wherein said electrically heated catalyst comprises metal monolith without noble metal washcoat.

14. The process of claim 3, wherein said air with enriched oxygen content has the
15 oxygen content ranging from 21 percent to 100 percent in volume.